chapter dealing with the extraction of alkaloids from the various crude drugs—seeds, leaves, roots—in which they occur, and the determination of the proportion present. This is followed by sections which treat of the individual drugs and the galenical preparations containing them. The alkaloids of gelsemium, hyoscyamus, stramonium, coca, colchicum, conium, hydrastis, ipecacuanha, physostigma, pilocarpus, tobacco, strophanthus, and veratrum are included, as well as the commoner alkaloids, and this part of the work should be a boon to chemists or students interested in the examination of these products.

The space allotted to the analysis of water and food-stuffs does not allow of the articles being discussed at any length. Milk, butter, oils and fats, starch, and sugar are dealt with, and the outlines of principles and processes given are trustworthy as far as they go.

For the sake of the numerous references which the author supplies, one can readily forgive him his occasional lapses into slipshod English. The book contains a wealth of information, and considered as a whole is an excellent production. C. S.

## OUR BOOK SHELF.

*Geologischer Führer durch Dalmatien.* By Dr. R. Schubert. Pp. xxiv+176. (Berlin: Borntraeger, 1909.) Price 5.60 marks.

THERE are few portions of the map of Europe more attractive to the eye of the geographer and the geologist than the coast of the northern Adriatic. On the one hand we have the coast of deposition, starting from the Apennine foothills north of Pesaro, and more and more emphasised in the swampy flats of Ravenna and Venice, until we reach the jungle-like woods of Monfalcone. Beyond this we come against steeply descending limestone hills, with a "karst" character already manifest. The blue water at Trieste speaks of the coast of subsidence that stretches to the south-east, with chains of islands parallel with the tectonic features of the land.

Dr. Schubert sums up the geological features of Dalmatia in a work intended for the instructed traveller. Cretaceous limestones play a large part in the country, but are concealed over much of the north by fresh-water and marine Eocene strata. The marine limestones of Middle Eocene age are here overlapped by the brackish-water marls and fluviatile conglomerates of the Promina series, which were laid down in Upper Eocene, and possibly finally in Oligocene, times, after a general uplift of the area (p. xvii). The Eocene sea itself had represented a return to marine conditions after a terrestrial and lagoon stage which closed the local Cretaceous system. The folding from north-east to south-west, which has determined the salient features of modern Dalmatia, took place in Oligocene times (p. 173).

While the corresponding depression of the Adriatic may have begun, through the production of faults, soon after the Oligocene period, the sea did not invade the northern part of its present basin until what we may call human times. The Po and its tributaries, dependent on the growth of the Alpine chain, carried detritus across this area, and the sinking that has separated the alluvial Italian region from the rocky shore of Istria began in the Glacial and continued into the Roman epoch. The chains of islands off the Dalmatian coast have thus a very modern origin.

Dr. Schubert guides the traveller on a series of excursions, with useful notes as to the accommodation on the way. He wisely points out that a knowledge of either Italian or Croatian, preferably the latter, is essential for those who go beyond the tourist routes. The price of his compact volume, with its numerous references to other literature, will not seem high, when one considers how long it will be before any large number of visitors will venture far from the comfortable steamers on the coast. The desire for luxury during travel fortunately leaves many European districts, like Dalmatia, free for those who prefer to study and observe at their own leisure.

G. A. J. C.

*Entwickelung und Untergang des Kopernikanischen Weltsystems bei den Alten.* By O. T. Schulz. Pp. 143. (Stuttgart, Verlag: Neue Weltanschauung, 1909.)

THIS essay is the first of a series entitled "Weltanschauungs-Fragen." It deals with the ideas of the Greeks about the construction of the world, but, notwithstanding the title, the standpoint of the author is that of an historian of geography, and not that of an historian of astronomy. He is evidently quite at home when sketching the gradual rise of geographical knowledge and illustrating it by maps. But when he comes to the astronomical part of his subject he has apparently only Zeller's "Philosophie der Griechen" and Schiaparelli's memoir on the precursors of Copernicus to build on, while Schiaparelli's later paper on the very subject indicated by the title of the present essay, as well as the writings of Tannery, Hultsch, and others, are unknown to him.

The author makes no attempt to point out how Aristarchus may have been led to the idea of the earth's motion round the sun, and tells the reader nothing about the systems of movable excentrics or epicycles. He states that Aristarchus at first believed in the motion of the sun round the earth, and that he says so in his little book on the distances of the sun and moon. But there is not a word in this book as to whether the sun or the earth is in motion. As regards the failure of the heliocentric idea to secure acceptance, the only reason given by the author is that Hipparchus considered it not to be based on sufficiently lengthy observations. We cannot imagine where the author got this piece of information from, as there is no allusion to the system of Aristarchus in the preserved writings of Hipparchus and Ptolemy. What Hipparchus did say was that he did not himself possess sufficient observations to work out the theory of the orbital inequalities of the five planets. But these have nothing to do with the motion of the earth. The author adds that there is no original research in the Almagest!

When dealing with the views of Plato, the author repeats the statements current sixty years ago about Plato's doctrine respecting the rotation of the earth and about his change of opinion in his old age as to which body was in the centre of the world. One cannot help wondering whether it really is of any use to try to kill historical errors. They seem to be immortal. At least, popular writers on the history of science are generally not aware that they are dead and buried long ago. J. L. E. D.

*Excursionsbuch zum Studium der Vögelstimmen.* By Prof. Voigt. Pp. 326. (Leipzig: Quelle und Meyer, n.d.) Price 3 marks.

THIS is the fifth edition of an excellent manual of the songs and other notes of birds, suitable for carrying in the pocket during walks and excursions. As a matter of fact, it is better for the learner to find out for himself

what bird it is to the voice of which he is listening, for in the process, even if it be a long one, he will learn a good deal about the bird and its habits. But some learners are less gifted than others with a capacity for listening carefully, and have little or no musical ear, and a book like this may be of good service to these. Dr. Voigt's method is a very sensible one; he makes no great use of musical notation, but has invented a notation of his own which is likely to be much more useful to the ordinary observer. By a series of dots and dashes, inclining or curving up or down if necessary, he contrives to give a very fair idea of the character of the notes he wishes to represent, and also of their tendency to rise and fall. In some cases, *e.g.* in that of the swallow, he does not make use of either kind of notation, simply because neither would be any real help. His descriptions of the songs seem remarkably accurate. We have tested them in the case of many of the small warblers, which are among the most difficult to describe, and have invariably found them excellent, and the tendency of particular individuals of a species to vary the utterance is also duly noted. Thus of the marsh warbler (*Acrocephalus palustris*), Dr. Voigt says that it has troubled him more in the way of variation than any other species. In writing of this species he seems to have omitted the peculiar alarm-note uttered when an intruder is near the nest, but as a rule something is said of alarm- and call-notes. On the whole, we consider this book the most useful practical manual we have met.

W. W. F.

*The Force of the Wind.* By Prof. Herbert Chatley. Pp. viii+83; illustrated. (London: C. Griffin and Co., Ltd., 1909.) Price 3*s.* net.

PROF. CHATLEY has evidently devoted himself to a study of hydrodynamics and of its literature. He has attempted to boil down into an inordinately small compass, so as to be useful to engineers, an exposition of one of the most difficult and elusive subjects with which either the engineer or the mathematician has to deal. Explanation of principles which might be useful to a novice is replaced by a multiplicity of formulæ, which are flung at the reader with but little regard to dimensions or units. Numerical examples which, even in the case of clear exposition, always assist the student who wishes to apply a formula to any case in which he is interested are entirely absent.

Much information is collected, and numerous authorities are cited, but the result can hardly be considered satisfactory.

## LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

### Stability of Aëroplanes.

I HAVE recently been occupied with a comparative study of the theories of stability of aëroplanes deduced by Prof. Bryan, Captain Ferber, and Mr. F. W. Lanchester, and have just noticed a parallelism between the formulæ of Ferber and Lanchester which is strongly corroborative of the practical application of both.

In Ferber's "Les Progrès de l'Aviation par le vol Plane" (*Revue d'Artillérie*, November, 1905) he deduces from an extension of Prof. Bryan's analysis a formula for the conditions of longitudinal stability

$$\frac{P^2 b}{2Bg^2 k S} > 0{\cdot}8,$$

where P is the total mass of the machine, B is the moment of inertia about a transverse axis through the *cg*, S is the area of the supporting surfaces, *b* is the distance of the centre of pressure from the centre of area of the supporting surfaces, and K is an aërodynamic constant (0·7) kilometre-second system.

Lanchester's equation for longitudinal stability is

$$\Phi = \frac{4lH_n^2 \tan\gamma}{I\left(\frac{1}{K} + \frac{1}{\epsilon C \rho a \beta}\right)} > 1,$$

where *l* is the distance from the centre of pressure on a tail plane to the Cg, $H_n$ is the kinetic head of the machine corresponding to its normal velocity, $\gamma$ is the normal gliding angle, I is the moment of inertia about a transverse axis through the Cg, $K = \frac{\text{weight}}{(\text{normal velocity})^2}$, and the denominator of the second term in the expression within brackets is the lift on the tail plane (ft.-lbs.-sec.-units) divided by the square of the velocity.

Now the mass varies as the lifting force, which again varies as the square of the velocity, so that $P^2 \propto H_n^2$.

The torque which restores the machine to equilibrium depends in the case of a machine without a tail plane on *b*, and with a tail plane on *l*, so that if Lanchester's form is to refer to a machine without a tail plane *b* must be substituted for *l*.

B and I are identical in kind.

K varies as the lift ÷ square of the normal velocity, and since the lift varies as the product of the area and the square of the velocity, $K \propto S$.

The term relating to the tail plane is peculiar to that type studied by Lanchester, so that it can be omitted from our comparison.

Tan $\gamma$ is a constant for any one type of surface.

Hence it will be seen that the two formulæ are exactly of the same form, and it only remains exactly to determine the appropriate constants to discover if the two expressions can be made identical.

As has been pointed out by Prof. Bryan, everything (except for a machine with a tail) depends on *b*, and unless $db/d\alpha$, where $\alpha$ is the angle of attack, is negative, the torque will not produce equilibrium. The Government's committee is, I believe, giving this attention.

I would further point out that the variations in velocity leading to Lanchester's "phugoid oscillations," and the oscillations due to the variation of *b* with $\alpha$, will serve to explain the two types of oscillation, respectively of long and short periods, observed by Prof. Bryan and Mr. W. E. Williams, and shown by the former to be deducible from the equations of motion.

HERBERT CHATLEY.

Imperial Railways of North China, Engineering and Mining College, August 24.

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IT is dangerous to draw conclusions from half-finished investigations, and anything I may now say must be subject to confirmation or modification when I have completely disposed of the mathematical theory of stability, both longitudinal and lateral, as I hope to do in a very few months unless any further pressure of professorial duties necessitates again hanging the matter up indefinitely. But results which I have recently obtained seem rather to corroborate instead of contradicting Lanchester's equation as holding good, subject to suitable assumptions and for the types of machine to which such a formula is applicable. I may state that I have already obtained expressions for the conditions that the quick or slow small motions may be subsident or oscillatory, and for their coefficients of subsidence in the first case and their periods and moduli of decay in the second. This applies to longitudinal stability, and a similar investigation is in progress regarding lateral stability.

It will, I believe, be easy to explain also *why* Lanchester's method, which to a mathematician certainly appears wanting in rigour, may lead to a correct result. But the matter will, I hope, be cleared up very shortly.

In the meanwhile, Prof. Chatley's comparative studies appear to indicate that we are within measurable distance of obtaining consistent results from widely differing methods.

G. H. BRYAN.